

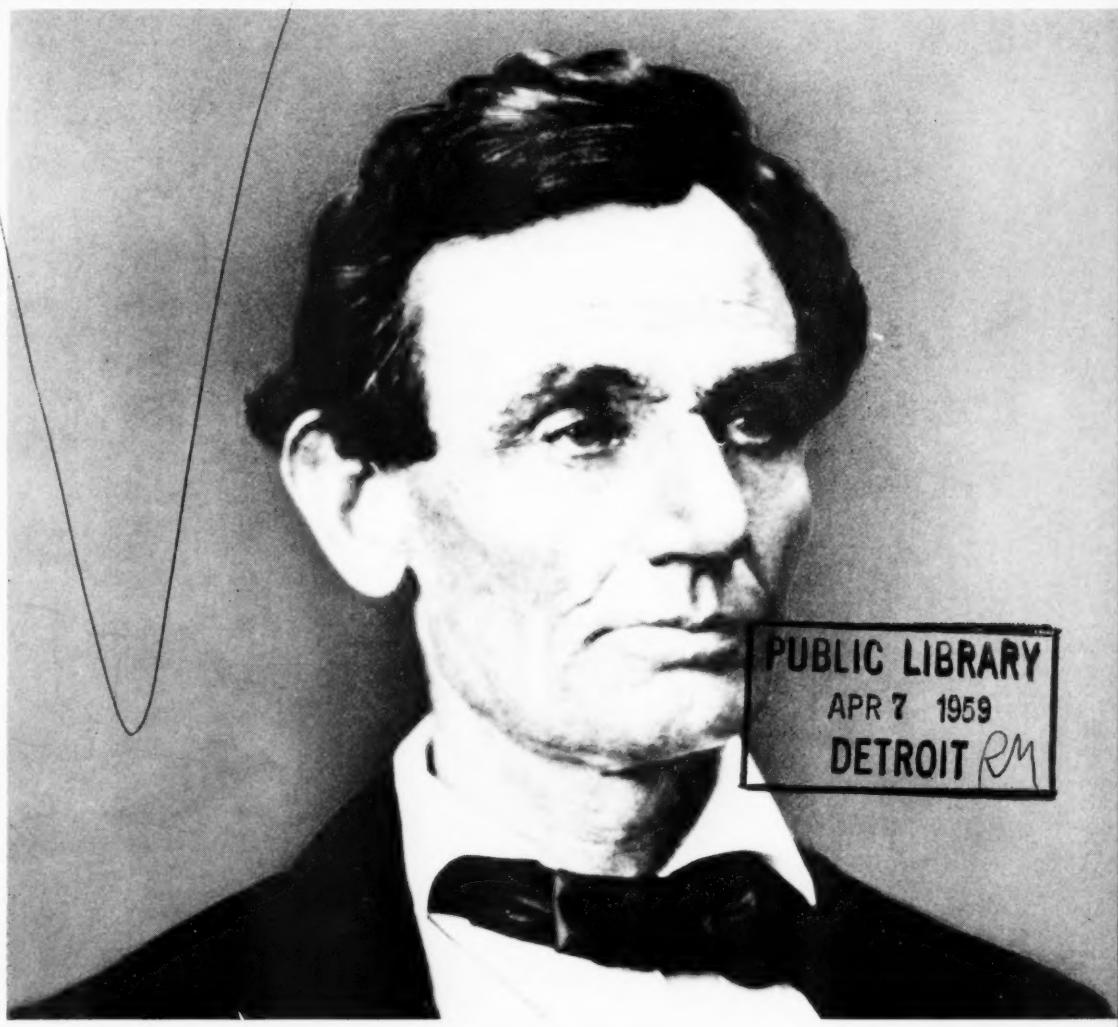
TECHNICAL DEPARTMENT

WESTERN
SOCIETY
OF ENGINEERS'

90TH
YEAR

Midwest Engineer

SERVING THE ENGINEERING PROFESSION



HIGHER EDUCATION AND SCIENCE — PAGE THREE

Vol. 11

FEBRUARY, 1959

No. 9



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COVER STORY

This issue celebrates the 150th anniversary of the birth of Abraham Lincoln. Lincoln, sometime visitor to Chicago, citizen of Illinois, and great War President of the United States of America, was born on February 12, 1809. He died in 1865, only four years before the founding of the Western Society of Engineers. The Society this year is celebrating an anniversary of its own — it is now 90 years old.

Rep. Nat. Com.

Dr. James R. Killian, Jr.
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The Chicago Plastering Institute has invited the members of the Western Society of Engineers to be their guests at a buffet supper and cocktails, after which we will be shown the new building industries laboratories.

We will see fire, sound, flame spread and impact tests made on various types of wall material and will be shown the different facilities that are adaptable to making tests

on other types of building materials.

This trip should be of great interest to members of the Fire Protection Section and all those interested in various phases of architectural designing.

Reservations should be made by calling the Western Society of Engineers Headquarters at RANDolph 6-1736 as far in advance as possible.

HIGHER EDUCATION AND SCIENCE

Dr. John T. Rettaliata, President of the Illinois Institute of Technology and Vice-President of the Western Society of Engineers, on February 13 presented the following address to the students of Elmhurst (Illinois) College as part of their current lecture series, "The Responsibilities of Higher Education to a Democratic Society."

I AM pleased to have this opportunity to greet members of the student body of Elmhurst College, and to participate in this series of lectures devoted to consideration of the responsibilities of higher education in a democratic society.

The beginning of your institution more than nine decades ago coincided with the opening of a new era in our society. The second half of the 19th century witnessed an accelerated movement away from the agrarian society of the early days of the Republic. Rapid strides were made in the mechanization of agriculture and industry. Manufacturing cities increased in numbers and the populations of the urban centers soared. There began an age of marvels which is continuing today.

The nation experienced many crises, and, as is often the case in periods of transition, progress was accompanied by serious social and economic problems. But, over the years, we have achieved a degree of progress that is unequalled anywhere else in the world. With our society firmly rooted in the idea of human freedom . . . the freedom of thought and inquiry and the pursuit of ideas and ideals . . . we have come far in the elimination of social injustices

and inequalities. We have provided more of the cultural and material benefits of life for more people than has ever been done before.

Elmhurst College, and other institutions of higher learning throughout the country, in developing the intellectual capabilities of our people, have furnished the essential ingredient in our national and personal progress. History has shown that there is a direct relationship between the living standards of a nation and the educational level of its citizens.

The challenges of the future are fully as serious as those of the past . . . perhaps more so. We face the vital problems of sustaining adequate defense against a ruthless potential enemy. We have ahead the task of supporting a growing population and rising standard of living in a time of diminishing natural resources. Revolutionary scientific and technological advances daily present new challenges to education.

The major purpose of higher education is to develop, in increasingly larger numbers of students, the qualities which prepare them for responsible citizenship and lives of maximum usefulness in our modern, complex society. The first essential in meeting today's problems, and attaining our future objectives, is the

HIGHER EDUCATION AND SCIENCE

determination to achieve better education, in *all* fields.

The subject of tonight's discussion . . . Higher Education and Science . . . is significant in considering the kind and quality of education which best prepares the student for mature responsibilities in a free society.

Man-made satellites circling the globe have brought into sharp focus the importance of science and technology in national and domestic affairs, and, consequently, in the educational program.

Advances in the exploration of outer space, nuclear research, and progress in chemistry, electronics, and other fields, daily are increasing the need for better understanding, by society generally, of the import of science and new applications of technological knowledge. Responsible men and women cannot properly stand aloof from science and its relation to our social and economic values and objectives.

Understanding

Understanding will justify the proper support of science and technology which are the foundation of our economy. It will help allay fear of science, where such fear exists. The fear of science, no more than the fear of any new truth, should not be permitted to deter the application of knowledge to produce useful results.

I think it would be helpful in achieving a fuller understanding of the role of science in higher education if we review briefly some of the problems and benefits which have resulted from scientific advances.

Science has given us great knowledge and power for good or evil. Such power in the hands of the wrong people, evil men, is a threat that is terrible to contemplate. The most familiar threat, of course, is that of nuclear weapons and missiles capable of delivering them to targets many miles distant.

But there are grounds for hope that this fearsome weapon will not be used in the destruction of mankind.

First, constantly increasing our scientific and technological competence will, as in the past, enable us to hold at bay

the menace to our social system of Russia's competing order.

Secondly, the devastating power of the nuclear weapon is forcing all men to consider the choices of good and evil . . . to think in terms of ultimate values and ultimate ends. To a degree never attained before, science is making men think in terms of the whole of mankind. I cannot come to any conclusion other than that the choice of evil use of nuclear knowledge is about to become virtually impossible. I think this is becoming increasingly evident, even behind the Iron Curtain.

Automation

Automation is another timely example of fear of scientific progress. There are those among the social scientists who still see the specter of vast unemployment lurking behind this advance in mechanization. Yet, there is ample evidence that technology is a creator, rather than a destroyer, of jobs.

Science has given us a mighty force for good. The scientist is concerned with the study of the forces of nature and the discovery of new knowledge. The engineer utilizes this knowledge, and the forces and materials of nature, for the benefit of mankind. These are the historic objectives of science and technology. Let me mention a few of their contributions to a better and fuller way of life.

To begin, science and technology have enabled this nation of more than 175 million people to reach the highest standard of living ever attained by man on earth. We turn out more than half the yearly total of world production, and do it with only about 7 per cent of the world's population.

We live longer and are healthier than earlier generations. Life expectancy at birth now is more than 22 years greater than it was at the beginning of the century. Most of man's bodily ills are now under control. Without science, pestilence and disease would stalk the earth.

Without science and technology, hard unrelenting toil would be the lot of most of us, and yield a bleak living at best. More and more, the burdens of labor have been shifted from the muscles of men to machines. At the middle of the last century, men and animals provided 74 per cent of the energy used in production; in 1950, only 6 per cent. And the work week has been reduced from an average of 70 hours to 40 hours.

Farming

Without science and technology, farming would be a form of serfdom, instead of the high, professional occupation it is today. Women would be condemned to drudgery in the home. Communication would be a matter of mounted couriers and beacon lights on hills.

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Our knowledge of space is being expanded by information furnished by the satellites. In the future we will know much more about the earth on which we live and its environment. Information sent back by the satellites is giving us new knowledge about the shape of the earth, the relative location of the continents, long range weather predictions, human survival in space, cosmic radiation, and the density of the upper atmosphere.

Atomic research will bring new wonders in healing, resulting in longer life and less pain and misery. The eventual mastery of the thermonuclear fusion process will usher in an era of unlimited supply of electric power which will expand tremendously our industrial productive capacity.

"But, how about social gains?" you may ask.

Any Social Gains?

Herein lies the heart of an old challenge to science, the belief that science and technology fundamentally contribute little to the non-material advance of civilization.

It is my conviction that science and technology are having profound and beneficial effects upon our social order. It is my belief that science is providing us with the means to attain many of the age-old goals of the idealists, and that it is laying the foundation upon which we can ultimately build the moral and spiritual order men have always craved.

By bringing the creature comforts to the great bulk of the population, science and technology have done more to reduce the festers of class hatred, and of class envy, and to obliterate class distinctions, than all the labors of the world's utopians and socialist dreamers.

It has always seemed to me that socialism consists essentially of a leveling *down* process. Science and technology are showing us how all men may be leveled *up*.

They are creating a new economic order in America, with profound social consequences. The productivity of the machine is making possible an increasing equity in the distribution of profits, and ownership in America is being widely distributed as more and more men and women become shareholders in industry. The fundamental forces of science and technology are thus creating

A wall of bubbles controls the waves at the entrance to the inner harbor of Dover, England, reports *Engineering News-Record*. The installation consists of two parallel submarine rows of air-bubble distributors placed across the 300-foot gap between two jetties. When incoming waves become heavy, air bubbles are released at regular intervals. The created turbulence sets wave energy working against itself. Result is a 50 per cent reduction in the height of the waves.

something of revolutionary consequence for the future: popular capitalism.

Another far-reaching result which derives from our material gains is bringing higher education within the reach of more young men and women than ever before. More than three and one-quarter million young people are enrolled in American colleges and universities, more than in any other country.

Increasing Leisure

Science has brought increasing leisure to mankind, and given men more time for creative pursuits, as well as for recreation.

Man's happiness consists, of course, of a host of indefinable things. High

among the influences that we can identify as contributing to the personal happiness of each of us is our work in our chosen occupation. One of the great social results which science is offering us is through the creation of new and interesting jobs. The vast choices of work opened today through scientific and technological discoveries are indicated by the existence of more than 30,000 different occupations in this country.

Science and technology create the wealth which supports our churches, our museums, our libraries, and other institutions of intellectual and cultural advancement. They give us the means to be generous. We share the fruits of our enterprise with other peoples. Here at home, individuals and corporations give to philanthropic causes a total estimated at well in excess of \$7 billion a year.

Only to Stagnate?

Great civilizations in the past have risen only to stagnate. Science makes stagnation of our society virtually impossible. For science, research and the stream of discoveries that flow from them are the nation's great energizing force.

The foregoing are but a few ways in which science and technology affect our national well-being and our daily lives. They suffice, however, to demonstrate that science is an integral part of our

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social structure. Since this is so, what then can be considered proper education for our times?

There are many who believe that only the liberal arts program can produce the truly educated individual . . . that scientific and technological education is too narrow, and lacking in the broadening influence of the humanities and social sciences.

Attitude Not New

Of course, such an attitude is not new. Thomas Henry Huxley, the English biologist and writer, in 1880 took occasion to comment on a similar opinion prevalent among the majority of educated Englishmen of the time. Huxley was speaking at the opening of Sir Josiah Mason's College of Science in Birmingham. He noted that a person versed in branches of knowledge other than literature was regarded as a "more or less respectable specialist." He was not considered educated.

Yet, in our own history, we recall such names as Jefferson and Franklin as men who were accomplished in many areas and made contributions to the best thought of their time. Both were men of science, but who can say that they were not men of broad vision and knowledge. Every generation has been richly endowed with scientists who possessed superior attainments in other fields of learning.

One of the great values of a liberal arts program is that it furnishes a link with the past so that experience of the ages can be called upon to influence decisions of the present. If these are to be intelligent decisions, however, they should also embrace current experience, which obviously would include science, the greatest single force affecting our lives today.

True liberal education is not a random sampling of ancient cultures. It is the result of a planned and balanced program which recognizes the inadequacy of preserving a pattern of specialized study, in some cases designed for preparing last century's clergymen. It provides guides for the selection of electives so as to avoid a cafeteria classics curriculum.

A proper liberal program prescribes areas of learning which permit the student to grasp the significance of tradition and history. Such a program recognizes that today's events are history tomorrow, thus justifying the

inclusion of current developments in science and technology.

A liberal education permits the examination of our own and other cultures, present as well as past, and science is obviously an intimate part of our present culture. Such an education is dynamic, adapting itself to the current needs of society. It is interested in ideas rather than techniques. It is ever probing for purpose, which means that science, with its steadfast spirit of inquiry, is a logical segment of it.

Many issues which concern the political life of our nation are becoming heavily conditioned by scientific considerations, and are involved with areas of information which are either unfamiliar or totally unknown to the vast majority of the voters.

Our National Defense

Our national defense depends principally upon our ability to maintain scientific and technological competence of the degree necessary to deter the forces of evil until men of broad vision and good will can resolve the differences which threaten civilization.

And in business and industry, at no time in history has there been such a direct relationship between the laboratory and the marketplace. Surely, an executive, to be effective, should have a sound knowledge of the importance of scientific research in influencing the growth and prosperity of his company.

Low-cost houses, literally built of dirt, are now under construction in New Zealand, reveals *Engineering News-Record*. Their eight-inch thick walls are made of "terracrete," a mixture of 12 parts dry sandy soil to one part cement. Reinforced concrete columns are first placed at every change in wall direction. Then the relatively dry-mix terracrete walls are built and capped with a continuous band of reinforced concrete.

It is important that the colleges and universities equip students to comprehend the vital role of science and engineering in our society as a basis for informed judgment. Consequently, they should provide more than a smattering of knowledge in these fields. Such study should not be an elective in the curriculum.

Now, let us consider the education of the scientist or engineer.

Thoughtful leaders in scientific and technological education concur in the idea that the broadly-educated individual is the better equipped to serve the community and the nation.

Scientists and engineers must be adequately prepared to recognize and accept the social responsibilities of their work

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which so vitally affects the well-being of all people.

The expanding complexity of civilization and industry . . . the heavier responsibilities the scientist or engineer is being called upon to assume . . . his increasing influence in management decisions . . . demonstrate that he is no longer an isolated individual working away in his particular field.

Thus, the educational process must encompass vastly more than the imparting of scientific knowledge and achieving technological competence. The scientist or engineer should be intelligently informed in other areas embracing literature, history, economics, political science and other subjects relating to the liberal arts field.

Strengthening of the Engineering Curriculum

The strengthening of the engineering curriculum in the fields of the humanities and social sciences has been a major development in technological education. Changes and extensions in curricula have steadily been effected to broaden the base of engineering education, and to develop in the student the potentialities of widest effectiveness in our modern civilization.

Studies conducted by the American Society for Engineering Education reflect progress in the broadening of the curriculum to contribute to the development of men and women who can face new and difficult situations involving both professional and social responsibilities.

One such study, published in 1956, showed that many of the leading engineering colleges have developed carefully planned programs that provide a sound introduction to the humanities, while simultaneously reinforcing professional education.

As the result of another study, covering the years 1952 to 1955 inclusive, the Society presented a number of recommendations for broadening and strengthening the curriculum. The recommendations pertinent to this discussion were:

1. The inclusion of elective subjects in the curriculum so as to develop the special talents of individual students, to serve the varied needs of society, and to provide the flexibility of opportunity for gifted students.

2. A continuing, concentrated effort to strengthen and integrate work in the humanistic and social sciences into engineering programs.

3. An insistence upon the development of a high level of performance in the oral, written, and graphical communication of ideas.

It was the consensus of the study committee that about one-fifth of the curriculum should be devoted to humanistic and social studies.

Education Not Static

Scientific and engineering education is not static. Its objective, is, and will continue to be, to produce well educated men and women who are capable of fulfilling the needs of the times . . . now and in the future.

The military implications of the Russian advances in science and technology point up the importance of these subjects in international relations. They also emphasize the cardinal role of scientific and technological education as the foundation of our national defense and the preservation of our way of life. It is an inescapable fact that we must strengthen and expand our scientific and technological competence. Our future as a free nation may depend upon how well we accomplish these objectives.

But we also need superior talents in other fields if education is to achieve its proper objective of advancing the spiri-

tual, cultural and material welfare of mankind.

We Need More Talents

We need more of all talents . . . teachers, physicians, lawyers, nurses, economists, and all the others necessary to the achievement of our economic potential, and realization of our cultural and spiritual values.

In summary, we need balanced education. We need qualified scientists and engineers, but we also need qualified liberal arts graduates. We must keep our sense of balance. There is just as much national danger in too much science at the expense of liberal arts as there is in too much liberal education at the expense of science. We will gain little if we enrich one field and impoverish the other areas of human endeavor.

Our goal must be more understanding by the scientist and engineer of social problems, and more understanding of science by society generally. Attainment of this goal is essential to the solution of the problems of our complex and advancing technological civilization.

Higher education should, as Alfred North Whitehead has stated, aim at producing graduates who "possess both culture and expert knowledge in some special direction. Their expert knowledge will give them the ground to start from, and culture will lead them as deep as philosophy and as high as art." END.

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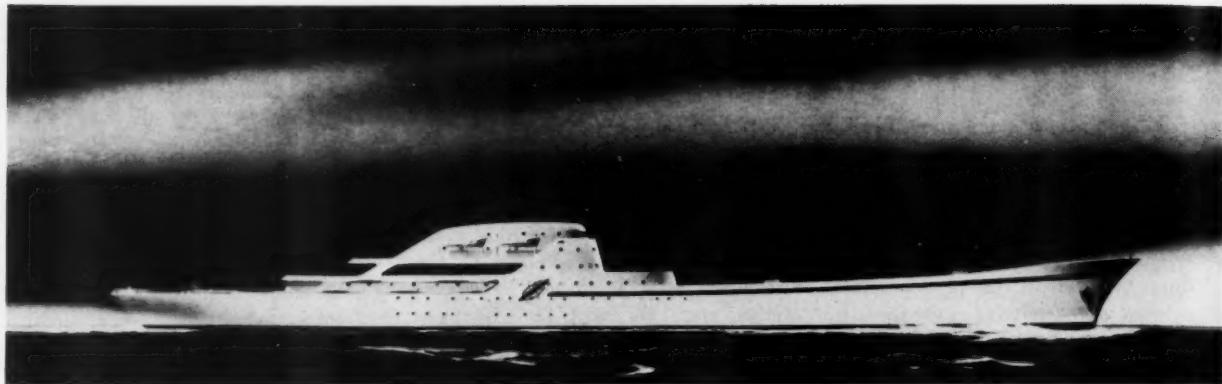
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The N. S. *Savannah* *Random Notes*

When the *N.S. Savannah*, world's first nuclear-powered merchant ship, puts to sea next year, she will get her "go power" from a unique source—atomic reactors. But for keeping her crew warm, the atomic ship will rely upon a more conventional system—Trane Maritime Convector.

Delivering 20,000 service horsepower for a cruising speed of 20 knots, the *Savannah's* nuclear plant will be an advanced pressurized water design. Propulsion power will be achieved by a steam turbine connected to one propeller shaft through double reduction gears. Operation of the entire plant will be from a console located within a control room adjoining the machinery space.

Aboard the 10,000-ton *Savannah*, two types of Trane Convector will be used. Steel cabinet units will be installed in the crew's quarters, staterooms and machinery spaces.

But steel and magnetic compasses make poor companions. The metal has inherent magnetic properties which adversely affect the compasses' accuracy. For this reason, completely non-magnetic Convector will heat the wheel houses within the magnetic circle of the *Savannah's* compasses.

Residential, big building and maritime Convector have been manufactured for many years by The Trane Company. In fact, Trane was the originator of Convector heating, marketing the world's first Convector back in 1926. But there is a marked difference between Convector for land installations and those for natural use.

Trane engineers paid a great deal of attention to construction details in designing Maritime Convector. Allowances had to be made for severe stresses and strains of ship movement. Exposure to highly corrosive salt water atmosphere had to be considered.

These and many other factors were compensated for when Trane manufac-

tured the 67 special Convector for use aboard the *Savannah*. For example, special heating elements with cast brass headers and copper fins were used in place of standard cast iron ones.

Incorporating all these special details, Trane fabricated special heating Convector for one of the world's extra special ships—the *N.S. Savannah*.

On Schedule

If the crew of the world's first nuclear-powered merchant ship, the *N.S. Savannah*, should want a motto, here's a suggestion: "On Schedule!"

Few atom-age projects have been faced with so many unknowns, yet few have met their construction deadlines as has America's new pride-to-be of the seven seas. That fact was made plain at Trenton, N.J. on February 27 as the DeLaval Steam Turbine Company tested the turbine-generators which will turn the ship's single screw and provide her electrical supply.

At the same time, the Babcock & Wilcox Company, prime contractor for the *Savannah's* entire nuclear propulsion system, reported this progress on the ship's atomic "heart:"

The first shipment of uranium oxide powder, the atomic fuel which will supply the ship's power, has been made to the B&W Nuclear Facilities Plant in Lynchburg, Va. Prior to the shipment, the techniques to be used in producing the uranium pellets from powder had been worked out, and some 18,000 sample pellets were made during test fabrication.

Tests of the prototype fuel rods which will contain the uranium pellets will begin "in a matter of days," at the B&W's Critical Experiment Laboratory, which is also in Lynchburg. These tests will help determine the behavior of the rods at the high temperatures and pressures to which they will be subjected in the operating reactor.

A new type of experimental and test facility, consisting of a pool-type reactor with a special chamber built into one wall of the "pool," will make such tests possible. The unique testing facility, built by B&W to fill a need in the development of reactor technology, was completed and started operation in September of last year.

Also at the B&W laboratory, an experimental core, simulating that which is to be installed in the *Savannah*, has been operating since February of 1958 to complete confirmation of analytical calculations made in the process of designing the ship's propulsion plant.

The "heart" of the reactor, or fuel core, where sustained fission-heat will be generated, will have the benefit of a test run before it is installed aboard the *Savannah*. Here, again, is another safeguard against anything which could interfere with the *Savannah*'s tight construction schedule.

Other Feverish Activity

At B&W's main Boiler division plant in Barberton, Ohio, feverish activity of another sort has been taking place. Here, most of the nuclear propulsion system's heavy components are taking shape rapidly. The 100-ton pressure vessel, which will house the core itself, has been fabricated and is undergoing extensive machining operations.

The first of the reactor system's two heat exchangers, which use fission-heat from the reactor core to produce steam for the turbines, were shipped the week of February 27 from Barberton to Camden, N.J., where the *Savannah* is being built.

The second heat exchanger, or steam generator, was scheduled to be shipped March 31. Each of these units is 20 feet long, 3 feet across, and contains 812 stainless steel tubes $\frac{3}{4}$ inch in diameter.

While work moves steadily on the *Savannah*'s atomic propulsion system, work of another sort is progressing steadily on B&W and Lynchburg College premises where the first of two groups is approaching completion of the N.M.S. crew training program.

When the ship is commissioned, perhaps no one man will feel a greater sense of achievement than President Eisenhower, whose Atoms-for-Peace proposal in 1955 put life into the project.

The *Savannah* will be 587 feet long, 78 feet in beam, will cruise about 20 knots and will have an estimated range of 350,000 miles on one loading of nuclear fuel. Boasting a bubble-shaped superstructure, the ship will transport 60 passengers in 30 staterooms, and will carry about 10,000 tons of cargo in seven holds.

Turbine-generators Tested

The main propulsion machinery for the *N.S. Savannah*, received its initial shop test February 27 at De Laval Steam Turbine Company, and was scheduled to be shipped during the week of March 2 to the New York Shipbuilding Corporation, Camden, N.J., builders of the vessel.

Design of the nuclear power plant was based on combined studies by The Babcock & Wilcox Company and De Laval Steam Turbine Co. submitted to the Maritime Administration in 1956. On the basis of these studies, the Atomic Energy Commission awarded the contract for design, development and fabrication of the power plant to The Babcock & Wilcox Company on April 4, 1957.

The machinery supplied by De Laval comprises the main turbines, main reduction gear, turbine generators, main and auxiliary condensers, feedwater heaters and feedwater pumps.

The power plant will deliver 20,000 normal shaft horsepower and a maximum continuous output of 22,000 shaft horsepower. The propulsion unit is of the cross-compound type with the double reduction gear turning the single propeller shaft at 106 rpm normal.



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Authorities Look At Water Resources

Local, state and federal authorities are taking a longer look into the potential of water resources, reports *Engineering News-Record*.

One of the most significant advances in over-all river planning in 1958 occurred at the federal level when a rivers-and-harbors bill included a broadened water-supply concept. For the first time, the Army Corps of Engineers and the Bureau of Reclamation are allowed to provide water storage capacity for future needs in their new reservoirs.

Out of Texas (drought-plagued in recent years, but flood-washed in 1958) came a real contribution to partnership-type, over-all river planning. The state-created Trinity River Authority came up with what is believed to be the first comprehensive basin-wide river program in the U.S. to be developed at local level.

Long-Range Development

The plan involves cooperation of local, state, and federal authorities. It covers long-range development of the entire 18,000 square mile Trinity watershed, with due consideration for water supply, siltation control, flood control, navigation, pollution abatement and soil conservation.

That there is a need for a longer look into the future potential of water resources can best be illustrated by federal work in the Columbia River area, the magazine states.

A little more than ten years ago, there had been a feeling that Bonneville and Grand Coulee Dams generated more power than the area could absorb for many years.

However, when rising power demand proved the assumption false, McNary Dam was begun. Soon afterwards came Chief Joseph and The Dalles, both now virtually completed. And last year, construction was started on what is believed to be the last federal project on the Columbia River's main stem, John Day Dam.

Awareness of Problem

A growing awareness of sewage treatment and pollution problems is indicated by activity at state and local level—in Pennsylvania, Texas, Kentucky, Vermont, Washington, Tennessee, California, to name a few states.

But everything is not bright in the pollution picture. Public Health Service

statistics show that although sewage treatment plants are going up at a faster clip, the need for them is growing even faster.

Industrial activity in water pollution is promising. One company announced the defeat of a nylon-wastes problem in Pensacola, Fla., after two-and-a-half years of research and development work on this problem. And at Bound Brook, N. J., another treatment plant was opened to handle "waste that couldn't be treated."

A simple treatment plan has been considered by the Ohio River Valley Water Sanitation Commission for the control of the concentration of untreatable chloride wastes in the Ohio. The scheme is simply storage of the wastes at the point of origin for later release in amounts and at times picked to avoid overloading the river.

This method could also help control other pollutants. The commission is also considering it for control of taste and odor-producing substances.

Aircraft, Missile Fuels To Be Expensive

Hydrocarbon fuels for supersonic aircraft and missiles are expected to cost five to ten times the present price of jet fuel, the American Institute of Chemical Engineers was told on Mar. 17 at Atlantic City, N. J.

"If future specifications should require pure chemical compounds rather than mixtures, higher costs should be anticipated," Ernest E. Donath and Martin Hess, Koppers Company, Pittsburgh, Pa., said in a paper, "Logistics of Some Thermally Stable Hydrocarbon Fuels," presented at a session on thermal stability of jet and rocket fuels.

They said that on the basis of tests by Wright Air Development Center, "it

seems that saturated hydrocarbons, especially bicyclics, obtained by hydrogenation of substituted aromatics will fulfill the requirements for thermally stable jet and missile fuels."

For condensed bicyclic and higher aromatics, they said, coke oven tar "is at present the main commercially available raw material" for missile fuel, "although naphthalene and its homologs can also be obtained from petroleum."

The two engineers said that "It has been estimated that the demand for high temperature fuels will approach 100 million gallons (6,500 b./d.) a comparatively small volume in relation to the consumption of conventional jet fuels."

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Engineers

The appointment of three new members to the Board of Directors of the Henry Pratt Company was announced by E. B. Cottingham, president. Named to the positions are H. L. Williams, vice president in charge of manufacturing, R. P. Saar, chief engineer, and H. C. Schwenk, sales manager of manufactured equipment.

M. S. Adler, president of Precision Transformer Corporation, 2218 West Lake Street, Chicago, has announced that Victor M. Prybyl has been elected vice-president in charge of manufacturing. Prybyl was promoted from works manager of Precision Transformer Corporation.

Frank M. Scott, MWSE, Chairman of the Western Society Program Committee, was recently named Manager of Utility Sales for the Chicago District of Allis-Chalmers Manufacturing Company.

Stanley A. Kroll has announced his resignation as vice president of Taller & Cooper, Inc. and the opening of a consulting engineering office at 35 Gold St., in Brooklyn, N.Y.

He has been engaged in the design and planning of toll plazas and revenue collection systems for the past 30 years on such projects as the Queens-Midtown Tunnel, New York City; New York State Thruway; Mystic River Bridge, Boston, Mass.; Kansas Turnpike; Autostrade del Sole, Italy; and the Tancarville Bridge, France.

Kroll plans to extend his practice to all phases of electrical engineering, and the design of special devices necessary for particular applications in revenue control and related fields.

Russell L. Moubrey was recently appointed western regional sales manager for G. H. Leland, Inc. He had been Le-

land's eastern district sales manager for two years before this promotion, which became effective February 1.

As announced by national sales manager Hans Belitz, Moubrey's responsibilities will include supervision of all Leland sales in states west of the Mississippi, plus the Chicago area, working out of G. H. Leland's home plant in Dayton, Ohio.

A member of the American Institute of Electrical Engineers (AIEE), Moubrey joined the Leland staff in 1949 following his graduation from Purdue with a B. S. degree in electrical engineering. He served as a sales engineer prior to his first management appointment in 1957.

G. H. Leland, Inc., manufactures Ledex rotary solenoids and selectors and Syncramental stepping motors for the electrical design field.

Dr. Roy Ringo (845 Waiola, LaGrange, Ill.), has been appointed Associate Director of the Physics Division at the Argonne National Laboratory.

The appointment was announced by Dr. Norman Hilberry, Argonne director.

Ringo will report to Dr. Louis A. Turner, director of the Physics Division.

Dr. Ringo, 41, is a ten year veteran of the government's atomic energy program. He joined Argonne's Physics Division in 1948 as an associate physicist. In 1957, he became a senior physicist.

He has specialized in experimental neutron physics. This work is concerned with the properties of sub-atomic particles.

Dr. Ringo was a member of an Argonne-University of Chicago research team that proved last year—with the aid of an Argonne nuclear reactor—that the law of "parity conservation" does not apply in the radioactive decay of the neutron.

Earlier, Dr. Ringo participated in a number of research projects at Argonne. Among them was the assisting in the

design of production reactors now being used at the U. S. Atomic Energy Commission's establishment at Savannah River, Georgia.

From 1941-1948, Dr. Ringo served as a physicist with the U.S. Naval Research Laboratory in Washington, D.C. He began his career in 1941 as a physicist with the U.S. Rubber Co., Providence, Rhode Island.

Dr. Ringo was educated at the University of Chicago. He was graduated with a bachelor of science degree in physics in 1936, and received a Ph.D. in physics in 1940. He studied for his doctorate under the late A. J. Dempster, a pioneer in the field of mass spectrometry.

He has written 15 scientific papers primarily concerned with experimental neutron physics, for a number of learned journals. Among them are the *Physical Review* and *Nuclear Science and Engineering*.

Dr. Ringo is a member of the American Physical Society, the Neutron Measurement Panel of the National Committee on Radiation Protection, and Sigma Xi, an honorary scientific frater-

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Maatman graduated from Illinois Tech in 1951. After two years in the U. S. Coast Guard where he served as fire protection officer for southern California, he joined the Illinois Inspection Bureau where he has been for the past six years. He has also lectured extensively at various fire protection conventions and has taught at the Illinois Fire College. He was recently named fire protection consultant for Hazelerest, Ill., where he lives with his wife and 3-year-old son.

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Reviews of Technical Books



Surveying Instruments

Surveying Instruments and Methods, by Philip Kissam, Professor of Civil Engineering, Princeton University, McGraw-Hill Book Co., Inc., New York 36, N. Y.

Mr. Kissam's book, *Surveying Instruments and Methods*, provides reliable guidance in surveying techniques. It provides complete details and tested methods for all phases of small area surveying. It explains modern developments in instruments and methods—from self-leveling levels to optical tooling procedures. Practical directions for mapping and measuring small areas, aligning tools accurately, and establishing close-tolerance dimensions for large products are included.

Among the subjects discussed are: Horizontal measurement, the transit, traverses, the level and benchmark leveling, establishing line and grade for construction, optical tooling, topographic surveying, drawing maps and keeping records, and the elements of the use of aerial photographs.

Surveying Instruments and Methods is a valuable guide for all surveying problems.

Reinforced Concrete

Reinforced Concrete Fundamentals, by Phil M. Ferguson, John Wiley & Sons, Inc., New York 1, N.Y., 1958. Pages 604. Price, \$9.50.

This text is designed for a beginning course in reinforced concrete with emphasis on ultimate strength theory. However, the working stress method of design of beams, slabs, and columns is adequately covered with respect to the ACI Building Code requirements.

Prestressed concrete analysis is based on Joint ACI-ASCE Committee Specifications and presents a general idea of how such concrete responds to loads.

Much of the book is devoted to the ultimate strength and other nonworking load methods of design. The ultimate strength theory is founded upon the proven behavior of reinforced concrete members as revealed in numerous laboratory investigations. The ultimate strength theory, long used in some form in several countries, has only recently received the support of American code committees. In 1956, the ACI Building Code incorporated provisions for ultimate strength as an alternate method.

An entire chapter is devoted to an elementary treatment of yield-line theory as a design guide. Yield-line theory is an ultimate strength method not recognized by the ACI Code and which is little known to engineers in this country. A practical application of this design method is in connection with two-way slabs and irregular slabs. Slabs are normally underreinforced, with much less steel than a balanced design (at failure). As a result, on progressive loading the

steel reaches its yield-point stress before the slab reaches its ultimate strength. As the steel yields, the center of compression on the cross section moves nearer the face of the slab until finally a secondary failure in compression takes place at a moment only slightly greater than the yield-point moment.

The author includes in the Appendices most of the design tables and curves normally found in similar texts. Also included is the development of the limit design ideas as applied to frames.

In the preparation of this text, the author has drawn upon his experience of thirty-five years as a designer, teacher, and research man. He has written a forward-looking text rather than simply recording present practices.

G.D.W.

Physical Laws

Physical Laws and Effects, by C. Frank Hix, Jr. and Robert P. Alley, published by John Wiley & Sons, Inc., New York 16, N. Y. 1959. Pages, 291, Price, \$7.95.

Physical Laws and Effects is a centralized source of information, and is the latest addition to the well-known General Electric Series.

"New products, new inventions, innovations, and whole new industries often originate from an idea inspired by an unusual or unapplied law and effect," write Hix and Alley. But how can the basic material best be organized to set off fresh chains of thought? The authors find the answer in a unique triple cross-reference system which permits the search of laws and effects to become a practical part of the engineering approach to problems.

The entire compilation is indexed alphabetically by: names, physical quantities involved, and fields of science. To further effect its usefulness, the volume's format is keyed to a short description, an illustration, an indication of the expected magnitude, and a reference or two useful in gaining additional information.

Both affiliated with the General Electric Company, the authors have ample experience to prove their contention that "the possibilities for new applications of a law are never exhausted." Their book includes previously scattered material and by its organization, permits the engineer to build his personal index around the ones given here.

Mathematics

Living Mathematics, by Ralph S. Underwood and Fred W. Sparks, Professors of Mathematics, Texas Technological College, McGraw-Hill Book Co., Inc., New York 36, N.Y. Price, \$5.50.

What Makes An Engineer Successful?

What factors contribute to the success of a young engineer?

A year's experience with a "Personal Follow Program" conducted by Westinghouse Electric Corp., and participated in by 1,200 engineers with experience ranging from one to six years, indicates that these factors are important:

Spatial vision, advanced engineering and quantitative ability.

So said G. E. Moore, manager of graduate student training for Westinghouse in a paper "1200 Case Studies of Engineering Motivation," presented on February 3 at the Winter General Meeting of the American Institute of Electrical Engineers in the Hotel Statler Hilton.

Eighty-nine per cent of the 1,200 "have 'Spatial Visual Scores' some 175 points above the National Mean," he said. "This would indicate a rather high ability to translate the spoken word, analytical terms, ideas, etc., into 3-dimensional mental images ultimately leading to realistic devices. The 'Advanced Engineering Scores' of the entire group were some 100 points above average, whereas in 'Quantitative Ability' this difference was 133 points. This would seem to indicate that Engineering Ability and Engineering Analysis are also keys to success in this area . . . this is by no means conclusive. However, we are optimistically hopeful that continuing analysis of the data we are collecting will help us improve our program of selection, training and placement."

The program has uncovered, so far, "some twenty to thirty young men showing exceptional promise," he said.

Motivation seems to be a strong factor in the career of young engineers, some of whom possess unexceptional college records, yet blossom after several years in the field. He cited the case of one such engineer who has some 15 patents to his credit, one of which is "so revolutionary to assure the Corporation a position in leadership in one product for

some years to come." This same man has authored or co-authored seven papers, and recently co-authored a basic engineering book.

Reasons for this "surge" he said, were that the man assumed heavy engineering ability from the beginning of his career; he liked and respected his senior engineers and they gave him the full benefit of their experience; he was driven by a desire to prove that he could be a good engineer despite his average academic performance.

Contrary to some beliefs, and to the

surprise of those conducting the program, "external trappings," such as color of paint on the walls, amount of desk or office space, etc., were not influencing motivation factors.

Negative factors influencing the young engineer are related to immaturity and include placing location ahead of opportunity; placing his own or his wife's desire for material things, amusement, entertainment, etc., ahead of professional development, and the tendency to postpone starting a graduate program because of "bowling or softball night."

Needles Is Reelected EJC President

Enoch R. Needles, prominent consultant in civil engineering, has been reelected President of Engineers Joint Council for 1959, by EJC's Board of Directors. At the same time, Dr. Augustus B. Kinzel, vice-president for Research, Union Carbide Corporation, was elected vice-president of Engineers Joint Council.

Both men assumed office at the January 16th meeting of the EJC Board of Directors.

Needles has been identified with the financing, design and construction of major expressways, including the Maine, New Jersey and West Virginia turnpikes, and is a bridge builder of note. A native of Missouri and a graduate of the Missouri School of Mines, Mr. Needles is a past President of the American Society of Civil Engineers and of the American Institute of Consulting Engineers and the American Road Builders Association. Long active in engineering society affairs, he has, for the past year, headed Engineers Joint Council, the unity organization of the engineering profession, representing nearly 300,000 graduate engineers.

Dr. Kinzel, a native New Yorker, is one of the country's leading research metallurgists, pioneering in ferro-alloys,

atomic energy and, most recently, in heading the research for a new process for making titanium metal. He is a graduate of Columbia University, Massachusetts Institute of Technology and holds the Doctor of Science Degree from the University of Nancy, France. He has received honorary degrees from New York University and Clarkson College of Technology. He is currently President of the American Institute of Mining, Metallurgical and Petroleum Engineers and an active committeeman in the American Society for Metals and the American Welding Society. Dr. Kinzel has been with Union Carbide Corporation since 1926.

Other officers of Engineers Joint Council include E. Paul Lange, Secretary, Leroy K. Wheelock, Assistant Secretary and E. Lawrence Chandler, Treasurer.

No-grease Cars

Cars that need no greasing may be on the road by 1963, predicts *Product Engineering*. Citing the drop in the number of chassis fittings—56 per cent in the past seven years, the magazine says chassis fittings will drop steadily in cars from 1960 models on.

Book Reviews (continued)

Living Mathematics is an interesting book which proves that mathematics has drama, zest, humor, surprise, challenge, and human interest.

The book contains 14 chapters. Included are such titles as: Onward to Algebra, Now We Picture It, Putting Exponents

to Work, Measuring the Inaccessible, We Creep Up On Solutions, Variables Caught in Action, Our Results Grow Prophetic, and Fun with Figures.

Living Mathematics provides an interesting review for engineers or a valuable introduction for the uninitiated.



The Message is Simple— Our Projected Pyramid Has to be Completed!

We know it is unnecessary to urge you to do your part in this project. This is our collective responsibility. Every member is essential to the successful attainment of our goal . . . And the goal is 300 new W. S. E. members.

As you know, our 1959 Membership Campaign began in November, 1958. We cannot say that we have responded as one man to the challenge. Out of 3000 members, only 155 sent in one or more Proposal For Membership Cards with the names of prospective members. Only 100 applications for membership have been received.

Gentlemen — we solicit the help of each of you in this undertaking. We must complete our pyramid.

Cloud Seeding Causes Changes

In general, there is increasing evidence that airborne seeding of clouds with silver iodide particles caused important changes in the summer clouds over the Santa Catalina Mountains.

This was brought out as Drs. A. R. Kassander and L. J. Battan, director and associate director respectively of the Institute of Atmospheric Physics of the University of Arizona presented talks at the 174th National Meeting of the American Meteorological Society held in New York on January 29, 1959.

The research program, supported in part by the National Science Foundation, involves seeding one of two successive days according to a randomization scheme. This means essentially, that after it has been predicted that suitable clouds will form, a coin is flipped—if a head turns up the clouds are seeded, if a tail appears there is no seeding. This procedure was adopted to prevent a biasing of the results and permit the application of sound statistical tests.

The actual seeding was done from a Supercub airplane owned and flown by the Hudgin Air Service. The silver iodide particles were dispersed at between 18,000 and 20,000 ft. along a track up-wind from the mountain range. The particles were carried into the region of cloud formation by the winds.

Evaluation Method

In order to evaluate the effects of seeding, radar, cloud cameras and rain gages were employed.

Over the Santa Catalina Mountains there was a network of 29 recording rain gages. Comparisons were made of the rainfall on 32 seeded and 32 non-seeded days. It was found that the average rainfall was about 30 per cent higher on the seeded days. However, a statistical test showed that the probability that the results could have been a result of chance were 14 out of 100. An examination of localized heavy showers showed that they were more frequent on the seeded days. The likelihood that the difference was accidental was 6 out of 100. Although the probabilities of chance occurrence were too high to permit a firm conclusion that the observed differences were caused by seeding, one certainly can say that the results are very suggestive.

It was found from a study of the radar observations that more large thunderstorms occurred on seeded days. There were almost twice as many radar echoes extending above 30,000 ft. on seeded days. The statistical tests showed that there was about a 5 per cent chance that this difference was caused by chance. Again one would have to conclude that the evidence favors the conclusion that the seeding caused changes in the natural cloud processes.

The most striking effects of the seeding program were found from an analysis of lightning observations. This aspect of the research was partly supported by the U. S. Forest Service. During the summer of 1958 two students, Messrs. David Graham and James Riley were stationed on Mount Bigelow. They serviced various types of equipment and made observations of lightning strokes. It was found that on the 16 seeded days there was a total of 1265 strokes while on the non-seeded days there were only 138. In the past, it has been fairly widely predicted that silver iodide seeding would reduce the amount of lightning. A statistical test showed

that the probability of this result by chance was less than 2 per cent. This figure is low enough to conclude that the observed difference in lightning strokes was probably a result of seeding.

An analysis was made of the number of lightning-caused forest fires during the summer of 1957 and 1958. It was found that there were no more fires on the seeded days. As a matter of fact, there were fewer fires on the seeded than on the non-seeded days but the difference was small. The apparent paradox of more lightning but the same or fewer fires may have a simple explanation. Increased rainfall wets the mountains and reduces the risk of fire.

In summary, the observations collected during the last two summers have supported the hypothesis the airborne silver iodide seeding can cause important changes in the cloud, rain and electrical processes in the summer clouds formed over the mountains of South-eastern Arizona. Some aspects of the problem are close to solution. In order to obtain more conclusive results, it is planned to continue the research for at least one more year.

Automatic Techniques Meeting

The AIEE, ASME, and IRE are holding a Joint Conference on Automatic Techniques. The conference is to be held on May 11, 12, and 13 at the Pick-Congress hotel in Chicago.

The papers and discussions at this Conference are aimed at bringing to engineers and management of industry the story of how Automatic Techniques can be applied to any industry for eco-

nomic operation. The complex engineering involved in the production of the tools of automation such as computers, amplifiers, intelligence gathering and storing devices will not be considered.

The Conference is designed to show some of the characteristics and capabilities of the tools of automation, the type of intelligence they can receive and what results may be accomplished.

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New Products

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Liquid Limit Test

A new liquid limit testing machine for performing classification tests on soils has been announced by Soiltest, Inc. New molding and extrusion manufacturing techniques make uniformity of parts possible. This results in better correlation of test results performed on the new machine in laboratories around the world.

The liquid limit test is specified by American Society for Testing Materials, American Association of Highway Officials and in Federal Specifications.

All control parts are extruded through precision dies. The hard rubber base is formed in a mold to maintain uniformity of hardness, size and density on all devices. All adjustment features and operating hand crank are mounted on an aluminum housing.

The standard device, model CL-207, is equipped with a brass cup and grooving tool. Complete information on the new testing machine may be obtained by writing *Midwest Engineer*, Key 201.

Liquid Filled X-formers

After five years of development engineering, the Precision Transformer Corp., of Chicago, is announcing a complete line of liquid filled transformers, according to Melvin S. Adler, president.

These liquid filled transformers consist of both oil and askarel immersed types for distribution and power uses. The oil and askarel filled units range in capacity from 10 KVA up to 5000 KVA, at 69,000 volts. These units will also be designed for substations to be combined with primary and secondary switch gear installations. This line of transformers meets and exceeds all N.E.M.A., A.S.A., and A.I.E.E. specifications and are covered by Precision's standard 5 year guarantee.

The transformer tanks are constructed of aluminum or copper bearing steel. Covers are sealed with cork Neoprene gaskets. High and low voltage bushing terminals accommodate either copper or aluminum line leads. Line lead bushings also have cork Neoprene gaskets.

There is ample room and easy accessibility to the interior for maintenance,

inspection, and simple wiring. Transformer windings consist of copper coils, varnished in extrusion and insulated. They are thoroughly dried and oil impregnated through three complete cycles. Company spokesmen report the complete line features minimum weight and optimum operating characteristics such as low exciting current, low losses, good regulation.

For further information regarding the complete line of liquid filled transformers, write *Midwest Engineer*, Key 202.

Non-woven Felt

A non-woven felt made of synthetic fibers has been successfully field-tested in a wide range of industries, and has proved superior to felts of natural fibers in virtually all significant characteristics.

Known as Troyfelt, it was developed by Troy Blanket Mills of New York, N.Y., a pioneer in the field of synthetic non-woven material. Troy has announced, as a result of two years of extensive field and laboratory tests, that the new material is now available in commercial quantities in a wide variety of widths, and in a wide range of thicknesses, densities and permeabilities.

In the course of these tests, Troyfelt has already found wide preliminary application in such diverse fields as electronics, shoe manufacturing, dry cleaning and laundry equipment, railroads, mining and many other fields where

formerly natural fiber felts were used.

Besides possessing all the normal characteristics of natural fiber felts, Troyfelt has proved superior in many areas important to industrial users.

1. It has higher strength — up to 1,500 pounds per square inch, depending upon the fiber from which it is made.

2. It has greater dimensional stability in the presence of high temperatures and may be used continually at 400°F.

3. Troyfelt gives longer wear and better resistance to abrasion than natural fiber felts.

4. Troyfelt is resistant to most acid and alkalies.

5. Troyfelt is not affected by moisture and will not support rot, mildew or the growth of bacteria.

6. It is uniformly smooth and possesses the flexibility of all felts.

7. Troyfelt may be easily die cut and will not become ragged at the edges. It is also readily sewn.

8. Different fibers, and combinations of fibers, can be used to produce a felt "custom-designed" to meet a specific need.

Industrial Trucks

In aluminum reduction plants, the feeding of ore into reduction cells, and the removing of the hot metal for pouring into pigs, was long the exclusive job of overhead bridge cranes.

Disadvantages: lack of flexibility of fixed overhead equipment, too often delays.

For maximum flexibility, Anaconda Aluminum Co.'s 60,000-ton-per-year reduction plant in Columbia Falls, Mont., uses specially designed Elwell-Parker industrial trucks to do these jobs.

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A fleet of 14 of these electric-powered trucks handles the loading of the cells with alumina and briquettes. They also tap the cells and carry off hot metal in ladles for pouring.

To utilize the many features of industrial truck handling, Anaconda uses the Pechinet reduction process, which involves cells with vertical instead of horizontal anodes.

The cells can thus be side-loaded at floor level by the trucks.

Thus, overhead crane traffic is reduced and cranes can be concentrated on adjusting anode heights in reduction cells.

Literature

Roller Gravity

Lamson Corporation, Syracuse, New York announces the release of a new roller gravity handbook. It is a reference book for the engineer who uses conveyors to solve unit load handling problems.

There are many descriptive illustrations and photos explaining the application of gravity conveyors and the more common accessories. Easy to read charts and graphs are included to assist the engineer to match a conveyor to the loads. The book has a new flavor in that it points out conditions to be avoided.

"Roller Gravity By Lamson" is a handbook that will be an asset in the office of any business that handles materials.

Relief Valves

A new engineering bulletin giving complete details, specifications and operational features of a new, large capacity relief valve designed especially for ground handling and support equipment is now available from Fluid Regulators Corporation, 313 Gillette Street, Painesville, Ohio.

The new pilot operated relief valve is designed to control pressure in hydraulic, lubricating and fuel systems.

Copies may be obtained from Fluid Regulators Corporation, 313 Gillette Street, Painesville, Ohio.

Writing Review

A comprehensive review of the activity of engineers in writing articles and papers, as well as suggestions for engineering managers in organizing and maintaining productive article writing programs, are given in an eight-page

study available from Harry W. Smith Incorporated, technical information specialists in New York City.

Reporting the results of a survey recently conducted in cooperation with the editors of *Machine Design* among engineering executives in 170 companies, the study demonstrates how management can encourage technical writing and gives specific ground rules for engineering administrators in establishing sound business policies on often controversial matters like use of company or personal time and payment for published work. Eight steps for continuing success in building and maintaining a technical information program are suggested.

Copies of the report, entitled "Technical Writing by Engineers" are available from Harry W. Smith Incorporated, 41 East 42nd Street, New York 17.

Aluminum Soldering

Latest and most complete information available on the soldering of aluminum is presented in a new booklet by Reynolds Metals Company.

Newest addition to the Reynolds series of technical brochures, the handy-size reference includes data on soldering fluxes, irons and flames, and gives complete information on actual soldering methods such as hot plate, dip, furnace, friction, glass fiber brush and ultrasonic operations.

Types and properties of aluminum solders are explained, plus the corrosion of soldered joints and their performance in aluminum. Text is supported by diagrammatic illustrations.

Copies of "Soldering Aluminum" can be obtained by writing to Reynolds

Metals Company, Dept. PRD-6, Box 2346, Richmond 18, Virginia.

Vibration Control

The many types of vibration control mountings and materials available to solve vibration problems in industrial installations are listed and described in the latest bulletin from Vibration Mountings, Inc. The five basic vibration mounting methods discussed are: positive isolation, negative isolation, steel spring mountings, rubber-in-shear mountings, and pad type mountings. Specific installation stories are given in photograph-and-caption form.

The new bulletin features a helpful mounting selection guide, which makes it possible to choose the correct vibration control method and equipment, by means of a handy chart that indexes mountings under type of machine and operating area. Eighteen mounting products manufactured by Vibration Mountings, Inc. are described in detail.

Copies of this valuable new booklet from Vibration Mountings, Inc., 98-15 50th Avenue, Corona, L. I., N. Y.

Fastener Recognition

If the specification number of the fastener is familiar but you can't quite place the face, a simple fastener-recognition bulletin offered by Standard Pressed Steel Co., Jenkintown, Pa., may be just what you've been waiting for.

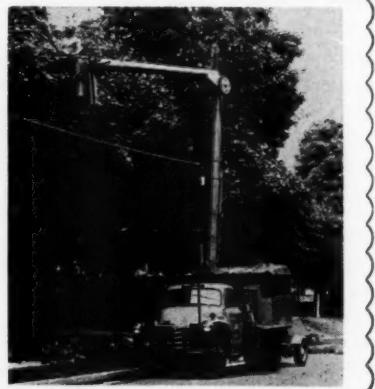
A two-way device for designers and purchasing agents, the quick-spotters works almost as neatly in reverse, when you want to tie a known configuration, say a spring pin, to its number.

Putting names to the shapes of more than 70 different fasteners which are normally specified for aircraft, missile,

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engine and related applications only by their national standard (NAS, AN, MS) designations, the literature spot-illuminates each with identifying front-and-side view sketches—then tells what type fastener it is.

Fasteners covered are those produced by SPS and subsidiaries—including SPS Jenkintown, SPS Western, Cleveland Cap Screw Company, Nutt-Shel Company and National Machine Products, but these take in most of the major high-strength, precision fasteners cited in national standard designations.

To simplify recognition and comparison, data is presented in simple, almost skeletal form. Fasteners, listed numerically by national standards number, include such types as socket head cap screws, internal wrenching bolts, various tension and shear bolts, both air frame and engine parts, hex heads, Clevis bolts, 12-point external wrenching bolts, self-locking nuts, self-locking plate nuts, spring pins, plugs and assorted other configurations.

Source (particular SPS firm supplying) of each fastener is listed, and in many instances minimum tensile or shear strengths are cited.

For a copy of Form 2460, write A. W. Scott, Advertising Dept., Box 891, Standard Pressed Steel Co., Jenkintown, Pa.

18-8 Stainless Steels

Engineers, purchasing agents, and others responsible for the procurement of stainless tubing, welding fittings and flanges will be interested in a new technical data folder published by the Tubular Products division of The Babcock & Wilcox Company. This folder contains technical data on analyses, corrosion and oxidation resistance, high and low temperature characteristics, physical and mechanical properties of the family of 18-8 stainless steels. Copies of the data folder, identified as TDC-190, are available without charge through the division's general sales offices at Beaver Falls, Pa.

Titanium

A comprehensive brochure on titanium has been published by Harvey Aluminum. The 36 page booklet is intended as a reference for engineers, metallurgists, and designers who want the latest technical information available on titanium.

In the section on how titanium is made, the text discusses in detail the conversion of the basic ore into sponge and

the melting of sponge into ingot form. The publication goes on to describe the advantages of titanium, covering strength and weight, high temperature performance, fatigue strength, corrosion resistance, erosion resistance, and thermal properties. A rating chart on the corrosion properties of the metal and specifications and characteristics of the various titanium alloys also are outlined.

In the section devoted to titanium mill products, the presentation reviews billets, biscuits and rings, hand and smith forg-

ings, press forgings, bars, extrusions, tubing, castings, and other commodities. Documented for ready reference are design data, weight tables, manufacturing limits, and tolerances for the various titanium products produced by Harvey.

Machining and joining and current and future applications for the metal are covered in the brochure.

For a free copy of this new report on titanium, write to Harvey Aluminum, 19200 South Western Ave., Torrance, Calif.

"Go All Out" On Your Market Research

If a company plans market research on a scientific basis, it was advised March 16 in Atlantic City, N.J. to "go all out."

So said C. F. Sanborn, of the Wyandotte Chemical Company, in a paper, "Market Research in the Chemical Industry," presented at a marketing symposium during the 39th National Meeting of the American Institute of Chemical Engineers (A.I.Ch.E.)

In discussing marketing research Sanborn told about a questionnaire he had disseminated in order to ascertain opinions on this type of activity. One question asked if there was a choice between dropping market research or advertising, or conversely doubling either, what should be done.

"All in all," he said, "the most interesting result from this Hobson's-choice round-up was that a sizeable percentage of the respondents said that they would drop market research first, if they had to, or double it first if they could, whereas no one said this about advertising. The reasoning seems to boil down to this—market research still has a long

way to go in terms of methods and status—if dropped on a formal basis, the work could still be done, as it is now done in hundreds of cases, by product managers, sales managers, development people, etc. But there is an instinctive feeling that a sympathetic approach to marketing and planned growth is not only important, desirable and possible, but that its rate of return tends to accelerate with growth—in other words, if you are going to do market research on a scientific basis, go all out! A big department can do proportionately much more than one or two people."

U-m-m, Good

A fruit-flavored vitamin supplement that can be chewed has been introduced by a leading pharmaceutical manufacturer, reports *Chemical Week*. The vitamin, in soft tablet form, is said to contain 125 per cent of the minimum daily requirements of vitamins A, D, B-1 and B-2, plus significant amounts of other essential vitamins.

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Combustion Engineering Acquires Nuclear Firm

Combustion Engineering, Inc., has acquired General Nuclear Engineering Corporation, a leading nuclear engineering and consulting firm headed by Dr. Walter H. Zinn, it was announced February 27 by Joseph V. Santry, chairman of Combustion. Santry also announced the election of Dr. Zinn as a vice president of Combustion and stated that he would be in charge of all the company's nuclear power activities. General Nuclear will be operated as a subsidiary of Combustion.

Dr. Zinn was the first director of the Atomic Energy Commission's Argonne National Laboratory. He served in that capacity from 1946 to 1956, resigning in the latter year to organize General Nuclear.

A Pioneer

A pioneer in the designing and building of nuclear power reactors, Dr. Zinn supervised the construction, under the late Dr. Enrico Fermi, of the world's first nuclear reactor at Stagg Field, Chicago, early in World War II. He was a member of the United States Delegations at both the First and Second International Conference on the Peaceful Uses of Atomic Energy held in Geneva, Switzerland in 1955 and 1958 respectively. He is a member of the National Academy of Sciences; Special Consultant to the Joint Congressional Committee on Atomic Energy; consultant to the Edison Electric Institute and a director of the Atomic Industrial Forum.

Combustion, Santry stated, has been active in the nuclear field for more than twelve years and has a current backlog of nuclear work amounting to approximately \$50,000,000. The company has extensive facilities for the design, development, manufacture and testing of complete reactor systems, including both light and heavy components. Its most notable current contract involves a complete reactor system for a submarine, the prototype installation of which is now nearing completion at the company's Nuclear Division in Windsor, Connecticut. At its Chattanooga (Tenn.) Division, the company has produced a large volume of heavy nuclear components including the reactor vessel for the country's first full-scale nuclear power plant at Shippingport, Pennsylvania, and the reactor vessel for the

world's largest fast-breeder nuclear power plant, now under construction by Power Reactor Development Company at Lagoon Beach, Michigan.

Chosen in 1958

In late 1958 Combustion was chosen to participate in two important Atomic Energy Commission projects. The first involves operation of the Argonne Low Power Reactor at the National Reactor Testing Station at Arco, Idaho, as well as research and development work to determine the possibilities of increasing the efficiency of this "package" nuclear plant. The second project, in which Combustion is serving as sub-contractor to the Stone & Webster Engineering Corporation, involves design and engineering studies for an advanced, large-scale pressurized-water reactor.

"General Nuclear," said Santry, "has

produced designs for nuclear reactors for all types of applications. It has recently designed a training reactor which presently is being installed at the University of Florida and is currently designing a general-purpose research reactor for the Georgia Institute of Technology. Other current projects are the development of a design incorporating nuclear superheat under the joint auspices of the Puerto Rico Water Resources Authority and the U. S. Atomic Energy Commission, and a research and development contract covering the design of an advanced type of gas-cooled reactor for a group of utility companies. The company has also performed consulting services for a number of leaders in the nuclear field in the United States and for atomic energy projects in Venezuela, Belgium, France and Sweden."

Lath Group Elects Collins

E. G. Collins, metal products manager, National Gypsum Company, Buffalo, New York, recently was elected president of the Metal Lath Manufacturers Association at the group's annual meeting in Cleveland, Ohio.

J. J. Ryan, vice president, Bostwick Steel Lath Company, Niles, Ohio, was elected vice president, while Donald R. Wadle, continues as managing director of the MLMA.

At this meeting, both Collins and Ryan indicated that increased sales of metal lath and plaster for the superior fire protection of schools and other buildings is anticipated for this year and for the years to come.

Collins is chairman of the Executive Committee. Other members of this committee are: H. B. Brown, merchandise manager, building steel products, United States Gypsum Company, Chicago, Illinois; G. J. Casey, manager of sales, metal lath products, Truscon Steel Division, Republic Steel Corporation, Youngstown, Ohio; and C. Webb, vice president, sales, Alabama Metal Lath Company, Inc., Birmingham, Alabama.

Other member companies of the MLMA include: Ceco Steel Products Corporation, Chicago, Ill.; Inland Steel Products Company, Milwaukee, Wis.; and Powell Steel Lath Corporation, Franklin Park, Ill.

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IRE-ARF Groups To Meet

New measurement techniques will be among major topics to be discussed at an Industrial Instrumentation and Control conference to be held in Chicago on April 14 and 15.

The conference is being sponsored by Armour Research Foundation of Illinois Institute of Technology in cooperation with the Professional Group on Industrial Electronics, Institute of Radio Engineers, and will be held on the IIT campus.

Another highlight of the program will be an address on "Digital Control Systems—Present and Future" by Dr. Montgomery Phister, Jr., director of engineering, Thompson-Ramo-Wooldridge Products Co.

The papers on measurement techniques will cover "Recent Developments in Transducer Technology" by Dr. Y. T. Li, associate professor of aeronautical engineering, Massachusetts Institute of Technology, and president, Dynamic Instruments Co.; "Use of Infrared Techniques in Industrial Instrumentation" by George F. Warnke, president, and

Herbert L. Berman, vice president, Radiation Electronics Corp., and "Nuclear Magnetic Resonance Applications" by Dr. Herbert Rubin, senior engineer, Schlumberger Well Surveying Corp.

Other papers will deal with various principles, techniques and applications of automatic control and instrumentation, including:

"Evolution of Automatic Process Control" by Glenn A. Pettit, Barber-Coleman Co.; "New Developments in Stream Analysis" by Victor H. Adams, Consolidated Electrodynamics Corp.; "Non-Destructive Eddy-Current Testing" by Dr. Glenn O. McClurg, director of research, Magnaflux Corp.; "Electronic Photography" by Meyer L. Sugarman, Jr., director of electrophotographic research, American Photocopy Equipment Co., and "Applying Military Reliability Research to Industrial Electronics" by Herman L. Wuerffel, manager, reliability analysis and measurements engineering, Defense Electronics Products division, Radio Corporation of America.

Others are "Future Trends in Instru-

mentation" by Denis J. McDowell, branch industrial manager, Minneapolis-Honeywell Regulator Co. "New Magnetic Recording Techniques for Data Processing" by Marvin E. Anderson, Armour Research Foundation, and "Aspects of Magnetic Recording Useful for Industrial Control" by Edward G. Wildanger, manager of applications engineering, Amplex Corp.

R. W. Bull, supervisor of electronic instrumentation, Armour Research Foundation (Chicago 16, Ill.), is conference chairman.

B-12 Shot Sheep

Sheep in Australia are healthier because they are getting shot with bullets. The bullets are thimble-sized pieces of cobalt shot into the esophagus and gullets by a tube-like gun, reports *International Management Digest*. The cobalt helps the sheep produce vitamin B-12, which is essential to blood formation. The bullets apparently remain in the digestive tract for some years, releasing a steady stream of cobalt into the animal's system.

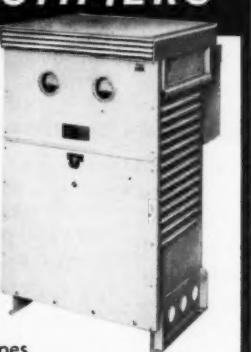
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Reactor Test Facility Achieves Criticality

The Transient Reactor Test Facility (TREAT), newest atomic research reactor of the Argonne National Laboratory of the U. S. Atomic Energy Commission, has achieved criticality, a self-sustaining chain reaction, at the AEC's National Reactor Testing Station near Idaho Falls, Idaho.

Criticality was reached on February 23, with 146 fuel elements containing a total of 5.38 kilograms of uranium-235.

TREAT is a nuclear reactor designed to produce short, extreme pulses of nuclear energy resulting in high temperatures. The derived heat will be sufficient to permit meltdown studies of samples of fuel elements and components intended for use in fast reactors. The TREAT facility will also provide a versatile irradiation tool for studying a number of other problems in the AEC's fast reactor safety program.

Operation of TREAT means the return to use of some of the graphite blocks incorporated into Chicago Pile I, the world's first nuclear reactor, built in 1942 under the west stands of Stagg Field at the University of Chicago. These blocks are part of a graphite neutron reflector around the TREAT fuel core.

Early studies with the reactor will be aimed at determining the effects of extreme pulses of nuclear energy on prototype fuel pins for the Experimental Breeder Reactor II (EBR-II), now being built for the Commission at the National Reactor Testing Station. A program of metal-water reaction experiments is also anticipated; this program is of interest to reactor designers in view of the limited knowledge of such reactions presently available.

The reactor is fueled by uranium-oxide uniformly dispersed in graphite. The latter acts as a moderator which slows down fission neutrons from uranium, maintaining them at slower (thermal) energies where they are readily captured by the uranium, thus continuing the chain reaction.

For flexibility of experimental arrangements, space is provided for loading of a maximum of 361 fuel elements.

The reactor cavity, 7 x 7 x 14 ft. high, can accommodate a 6 x 6 x 4 ft. high fuel core. Fuel assemblies are almost 9 ft. in length and consist of an upper and lower graphite section and a 4 ft. central sec-

tion of uranium oxide-bearing graphite which is the active (fueled) section. This central fuel section contains six 8" long fuel blocks canned as a unit in zirconium alloy. The end sections, which do not contain uranium are canned in aluminum.

Inside the reactor cavity, surrounding the TREAT fuel core, is a lining of graphite blocks which serves as a reflector to reduce the escape of neutrons from the system. With the lowering of neutron economy the chain reaction diminishes and the reactor becomes self-limiting. These graphite blocks are from two of the world's pioneer nuclear reactors, Chicago Pile I, built at the University of Chicago, and Chicago Pile II, a bigger reactor constructed near Argonne's present Lemont, Illinois location.

Transient pulses in this reactor are believed to be of greater intensity than those which can be safely attained in any other nuclear reactor.

The Argonne Reactor Engineering Division was in charge of the over-all de-

sign of TREAT. Argonne's Plant Engineering Division assisted as architect-engineer for the reactor building and shielding.

Fuel for TREAT was manufactured by Argonne's Metallurgy Division in conjunction with the Great Lakes Carbon Co. of Morton Grove, Ill.

The Idaho Operations Office of the Atomic Energy Commission administered the general construction contract for the reactor building, control house, and supporting service facilities. The \$334,000 construction contract was awarded to the Teller Construction Company, Portland, Oregon.

The completed reactor and buildings cost approximately \$1,000,000.

The Argonne National Laboratory is operated by the University of Chicago for the U. S. Atomic Energy Commission. Argonne research and development activities are carried on in two locations: near Lemont, Illinois, 25 miles southwest of Chicago; and at the National Reactor Testing Station near Idaho Falls, Idaho. END.

Disagrees On Red Education

Some American leaders have "thrown wisdom to the winds and scientific method to the dogs" in a tendency to over-estimate the Soviet educational system, a New York University professor of education recently returned from Russia said on February 4 in New York.

The claims made for Russian education have been accepted by many people "without question and without explanation," said Dr. William W. Brickman

who is also president of the Comparative Education Society and editor of *School and Society*. He spoke at a special session on Soviet education and technology during the Winter General Meeting of the American Institute of Electrical Engineers in the Statler-Hilton Hotel.

"... I feel," he said, "that American leaders have tended to overrate the foreign-language training program of the Soviet schools, that we have over-

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looked the overlarge classes and the multiple sessions, that we did not take proper cognizance of the underpaid teachers in the lower grades, and that we have shut our eyes to the supreme role of the Communist Party and Communist ideology in all aspects of Soviet education."

Dr. Brickman emphasized that it is "most difficult" to evaluate the Soviet school system and that some of the "best" scientific, educational and intellectual minds in the U. S. have been making value judgments "without adequate knowledge of its nature."

"In order to judge whether or not we should adopt any of the features of the Soviet educational system," he said, "we must first know that system with thoroughness; then we must be able to think evaluatively about it in term of its own

aims and those of the world in which we live; then we must be able to examine it in connection with the systems of comparable countries, both inside and outside the Iron Curtain; and, finally we must be intimately familiar with the strengths and weaknesses of the American school system."

In order to know the Russian school system "with thoroughness," he pointed out, it is necessary to take a series of important steps which to date have been taken by "but a few" Americans. He listed these steps as: Knowing the history of Soviet education and of the government; understanding the influence of Marxism-Leninism on the Soviet philosophy of education; studying carefully the textbooks, syllabi, student selection process, administrative procedures, and the Soviet educators' self criticism;

and, "not least of all," visiting classrooms and conducting discussions at length with teachers, pupils, administrators, functionaries of all types and men in the street.

Dr. Brickman said that his observations and opinions concerning the Soviet educational system are based on the following of these steps by himself and associates of the Comparative Education Society and on the value of the system in relation to its own goals and those of other systems.

He called for further "scientific and objective" study of both Soviet and Chinese Communist school systems, and urged the improvement of U. S. schools "intellectually, democratically, and otherwise (so) that we shall never have to worry about another nation's supposed scientific superiority." END



WSE Applications

In accordance with Article 1, Section 5 of the By-Laws of the Western Society of Engineers, there is published below a list of applicants for admission received since the last issue of the Midwest Engineer magazine.

Emmet Cassidy, Junior Operating Engr.,
The Peoples Gas Light & Coke Co.,
122 S. Michigan Av.

James F. Gunion, Designer, American
Bridge Division, 208 S. LaSalle St.

Daniel L. Stember, Designer-Estimator,
American Bridge Division, U. S. S.
Corp., 208 S. LaSalle St.

Howard L. Willett, Jr., President, The
Willett Company, 700 S. Desplaines
St.

G. H. Emin, Sr., Manufacturers' Repre-
sentative, 840 N. Michigan Av.

William Reinert, Junior Engineer, The
Peoples Gas Light & Coke Co., 122 S.
Michigan Av.

H. E. Wistreich, Director of Research,
Reliable Packing Co., 1440 W. 47th
St.

George L. Heminger, Planning Engineer,
Western Electric Company, Inc., Haw-
thorne Station.

Stanley L. Jameson, Manager, Jameson
& Associates, 173 W. Madison St.

John R. Cooper, Sales Engineer, Allis-
Chalmers Manufacturing Co., 135 S.
LaSalle St.

M. D. Corner, District Contracting Mgr.,
American Bridge Division, U. S. S.

Corp., 208 S. LaSalle St.
Robert H. Brown, Sr., Planning Eng.,
Western Electric Co., Inc., Hawthorne
Station.

George Field, Estimating Eng., Link-Belt

Co. (Caldwell), 2410 W. 18th St.
Kenneth C. Karg, Sales Engineer, Ed-
ward Valves, Inc., 1200 W. 145th St.,
East Chicago, Ind.

L. E. Weathers, Senior Devel. Engr.,
Western Electric Co., Inc., Hawthorne
Station.

Ralph S. Kirwin, Suprvr. Mgmt. Serv.
Div., Ernst & Ernst, Cleveland 14,
Ohio.

Edward G. Dunn, Engineer, Illinois Bell
Telephone Co., 212 W. Washington
St.

James H. Gibson, Exec. Assist., Warren
Barr Supply Co., 156 N. Jefferson St.

Economy Could Save \$4 Billion

"The American economy could save at least \$4 billion a year if all those who neglect standardization would now get wise to it," a group of engineers at a dinner observing National Engineers Week were told in Kingsport, Tenn. on February 24.

The speaker was Cyril Ainsworth, deputy managing director, American Standards Association.

"Unless you are thinking in terms of the national budget, this seems like an awful lot of money going down the drain," he continued. "As our industrial economy moves into the space age, becoming larger and more complex, the waste is likely to increase, if we don't make some radical changes in our standardization procedures."

As to what is meant by standardiza-

tion, Ainsworth pointed to an every day example.

The knives, forks, and spoons of our table cutlery are similar in size and shape to their counterparts all over the world. Their standards evolved through a slow process of elimination until the most acceptable shapes and sizes emerged. Practically all other tools throughout man's pre-industrial history were standardized by this same process of evolution, custom and preference.

This evolutionary process of standardization proved much too slow after the industrial revolution got into full swing. It took almost 200 years to develop and agree upon a workable safety code for steam boilers. Before it became available, boiler explosions were one of the most serious causes of loss of life and damage to property.

"In our budding space age, the nuclear reactor is comparable to the steam engine in the early industrial revolution. It's obvious that we can't wait almost 200 years for workable safety standards for nuclear reactors. Of course, individual nuclear reactors today are constructed with all possible safety features, but what is really needed are generally applicable safety standards for all nuclear reactors," Ainsworth pointed out.

ASA a Federation

The American Standards Association is a federation of 120 professional societies and trade associations. It has more than 2,000 company members. ASA's main function is to make possible the development and use of consistent sets of national standards. These are called American Standards.

Unfortunately, American industry does not understand and subscribe as thoroughly as it should to the idea of standardization, said Mr. Ainsworth. It is best understood on the engineering level and in the purchasing office. However, the money needed to carry on standards work has to be authorized by management, treasurers, or in many cases, by contribution committees. Since these executives often are uninformed about the value of standardization and have other problems foremost on their minds, they often fail to understand the connection between long-range standards and future benefits.

"Let me give you an example," said Ainsworth. "The nuclear standards program initiated under ASA procedures costs about \$25,000 a year to administer. This is small change compared to the multi-million dollar investments needed to develop nuclear power. Yet it is difficult, or almost impossible, to collect this amount fully! This in spite of the fact that the leading technical experts of every industry with an interest in this program are represented on the working committees. Financial support of ASA is too often handled as a contribution, much as a donation to the community chest. Such support is a sound business expense from which untold benefits are obtained."

The solution, said Mr. Ainsworth, is in education. Once basic research was viewed with suspicion. Today enlightened management knows its value. Standardization has not yet reached this stage of acceptance. Management is still

reluctant to pay for standards projects that have no apparent direct relation to current production. Yet there is enough evidence that some of the greatest money savings have come from the long-range standards projects affecting all industry. Industrial safety standards are a case in point. They have reduced a fantastic toll

in human lives and financial cost in lost manpower and production to an absolute minimum.

"In our grim competitive race with Russia, we cannot afford to fall behind just because we can't get together fast enough to develop useful standards," warned Ainsworth. END

IIT Professor Gets Grant

A beam of infrared light and an instrument called a spectroscope hold the key to molecular structure for Dr. Forrest F. Cleveland, professor of physics at Illinois Institute of Technology.

Under a grant of \$36,000 from the National Science Foundation, the third received for the purpose, Dr. Cleveland will continue a program of fundamental research into the spectra and, ultimately, the structure of molecules in various organic compounds.

Cleveland's basic method is not new. In a spectroscope, a beam of infrared light passes through the compound, and the same principle that produces a rainbow causes a spectrum to appear. In this spectrum, however, several of the colors are missing. The molecules of the compound, vibrating in space, have actually absorbed the infrared light of the same frequency. Thus, by finding what light is missing from the spectrum, the frequency of the molecules' vibrations is easily determined.

In the past, this principle has been widely used by science and, in particular, by industry to determine the composition of an unknown chemical compound. Now, by replacing the unknown chemicals by known and extremely pure compounds, Dr. Cleveland is able to determine amazingly precise vibration

data for many different molecules. These new and accurate readings are valuable not only to other scientists, but by extensive mathematical analysis, Dr. Cleveland is able to determine the actual position of individual atoms in any molecule.

For the present, Cleveland has limited himself to obtaining complete structural information for the 126 possible basic variations of methane, although on occasion he does analyze other interesting and significant substances. Under this new grant, he hopes to finish his present task and, utilizing the experience and knowledge he has garnered, probe deeper into the mysteries of the molecule, a thing so small that even the largest has not yet been seen by man.

Non-blistering Paint

A house paint has been developed which resists blistering under extremely severe conditions, reports *Chemical Engineering*. The new paint is chemically engineered to allow moisture vapor to breathe through while shutting out water penetration coming from the outside. It is claimed to be 50 per cent more durable than oil type coatings, dries to the touch in 30 minutes, is ready for second coat in an hour, and can be applied to damp surfaces.

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Turner Named UEC Contractor

Turner Construction Company of New York was named on March 2 as the general contractor for the United Engineering Center. This new engineering headquarters will be erected on the west side of United Nations Plaza between 47th and 48th Streets in New York.

The announcement was made by Andrew Fletcher, president of United Engineering Trustees, Inc., and president of St. Joseph Lead Company of New York.

The Center, a \$10,000,000 tower structure of 18 stories, with about 260,000 square feet of floor space, will house ten national engineering societies devoted to the advancement of engineering knowledge and practice. Together, they represent nearly 250,000 members in major fields of creative engineering. Engineering Societies Library, the nation's most comprehensive repository of vital technical information, will also be housed in the Center, as will five joint groups dealing with engineering research and improved educational standards.

Space has been set aside in the building for educational exhibits which will dramatize the creative role of engineers in advancing world living standards. The metal, glass and limestone structure, fully air-conditioned, will occupy a site of 37,000 square feet.

As announced previously, architects for the new Center are Shreve, Lamb and Harmon Associates; the structural engineers are Seelye, Stevenson, Value and Knecht; and the mechanical engineers are Jaros, Baum and Bolles.

What is UET?

The United Engineering Trustees, Inc., is an organization set up by participating engineering societies to perform management functions in their joint behalf, and is in charge of the planning and operation of the new Center. UET now operates the 50-year-old engineering headquarters at 29 West 39th Street, New York, which now houses many of the societies which will occupy the United Engineering Center.

Willis F. Thompson, vice president of Westcott and Mapes, consulting engineers of New Haven, Connecticut, is chairman of the real estate committee of UET, which will have general supervision of design and construction of the new building.

Engineering groups which will be

housed in the new Center include: American Institute of Chemical Engineers; American Institute of Consulting Engineers; American Institute of Electrical Engineers; American Institute of Industrial Engineers; American Institute of Mining, Metallurgical and Petroleum Engineers; American Society of Civil Engineers; American Society of Heating, Refrigerating and Air Conditioning

Engineers; The American Society of Mechanical Engineers; American Welding Society; and the Society of Women Engineers.

Joint bodies which have indicated a desire for space in the Center are: Engineering Foundation; Engineering Index; Engineers' Council for Professional Development; Engineers Joint Council; and the Welding Research Council.

Admiral Hussey Talks On Space Age

News stories about space age achievements no longer make page one unless the story is a climactic announcement by the U.S. or the Soviet Union. Vice Admiral G. F. Hussey, Jr., USN (Ret.), on February 28 in Syracuse, N.Y. told an Engineering Symposium of the Technical Societies Council of Greater Syracuse, Inc.

The Symposium was held in conjunction with National Engineers Week.

Admiral Hussey, managing director of the American Standards Association, in pointing out man's sophisticated attitude toward the space age, noted that major companies now are advertising for engineers to work on space projects, missile projects, and missile supports, "most of them in fields that 15 years ago were beyond the bounds of ordinary credence."

The automobile, once regarded as an object of wonder, was cited as an example of changing attitudes and an indication of "what may be before us in the space age whose current activities we are beginning to take . . . in our stride."

"The enormous complexity of the many new solutions to the problems of

propulsion, guidance, heat dissipation and atmospheric re-entry makes demands on our engineering skills far greater than any that have been posed by the developments which today are taken as a matter of course," Admiral Hussey said.

Alluding again to the auto, Admiral Hussey noted that a fifty-cent element could cause a breakdown of the entire mechanism. The modern missile is made up of an infinite number of parts, and its success depends on the effective operation of all parts, small or large.

The responsibility of the engineer in the space age, Admiral Hussey said, "is to insure that to the maximum degree possible reliability is engineered into components in the overall assembly." He emphasized the importance of reliability in the "fifty-cent" items as well as large elements in order that the time, effort and funds involved in each developmental shot may not be wasted.

"In the space age, as in the less sophisticated areas of modern life, standards serve as tools for engineers to save their talents and their energies for the solution of problems which are occurring

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for the first time," he said. The standard must demand such high quality in the product to which it applies that "the product's reliability is adequate for the complex problem presented."

He identified a standard as an acceptable solution to a recurring problem and noted that any standard approved as an American Standard must be received at least once in five years, Admiral Hussey said that an engineer in the space age must be prepared to make contributions to the initial development, to the frequent appraisal, and if necessary, to the revision of standards to the end that the tools at his command always be sharp.

Bench-scale Pilot Plants A Saving

Increased research costs and stiffer competition add up to favorable action on the use of bench-scale pilot plants, Donald E. Garrett, of the Research Department, American Potash & Chemical Corporation, Trona, Calif., said in Atlantic City, N. J. on Mar. 16.

In a paper, "Bench-Scale Pilot Plants," presented at the 39th National Meeting of the American Institute of Chemical Engineers in the Chalfonte Haddon Hall, he said that a reduction in the cost of pilot plants "could be an important step" in the direction of increasing operating efficiency. "The greater use of bench-scale pilot plants, both for intermediate and final design studies, can help achieve . . . economics in research and development studies."

He said that while bench-scale pilot plants are not new, having been used by the chemical industry for years, "Their more recent significance lies in the great need for improved efficiency and lower cost in research and development work . . . for a number of reasons, the extension of bench-scale studies to cover much, if not all, of the pilot plant investigation is more possible now than it has previously been."

Several factors, including costs, are focusing attention on the use of bench-scale pilot plants, with the large pilot plant required only in special and limited studies, he said. "This will require more emphasis on chemical engineering fundamentals in the development studies, and more ability and confidence in making the final design from lesser data."

Chemical Operator Training Cited

The increasing importance of properly trained chemical operators in the start-up of new plants was emphasized in Atlantic City, N. J. on Mar. 18 at the 39th National Meeting of the American Institute of Chemical Engineers.

The ever increasing investment costs, technical complexity of processes and automation "make it particularly important to have competent, well trained operating personnel," three Union Carbide & Chemical Corp., engineers said in a paper, "Chemical Operator Training in Start-Up of New Plants," which described the training program of their company. The paper was authored by P. A. Van Tassel, J. H. Field and P. W. Pontius.

"The chemical operator of 20 years ago," they said, "was largely a 'valve turner'; today he is a skilled technician who must be equipped with a consider-

able amount of fundamental knowledge so he can have the ability to reason his way to solutions of complex problems."

The trio said that dollar evaluation of programs weighed against their cost is difficult. "Safe efficient operation with a minimum of errors during start-up is the primary objective; the development of a strong, flexible permanent operating organization can be the long range benefit." In one unit which was placed in operation more than a year ago, there has not been one major spillage, serious operating error, or serious injury.

Anti-stall Device

An anti-stall device has been developed for cars and trucks that is said to overcome rough idling and stalling caused by high temperatures under the hood, reports *Fleet Owner*.

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Effective Use Of Technologists Asked

Any business that does not make effective use of its technologists and discourages the pursuit of technology "is accelerating the progress of the nation down (the) road to government ownership."

So the 39th National Meeting of the American Institute of Chemical Engineers was told on Mar. 1 in Atlantic City, N. J., by Kenneth M. Watson, of Illinois Institute of Technology, Chicago, during a symposium on business and technology.

In a paper titled "Technologists in Business," which reported on a study of business and technological performances of 20 large oil companies and 20 large chemical companies over a 10-year period, Watson warned that "The free enterprise system is fighting for its life in a world-wide competition which is basically technological in character."

Defense of System

The strongest defense of this system is success and to maintain a margin of superiority "will require continued increase in the quality of our technology and technologists," he said.

"Business," he continued, "is now paying for its short-sighted abuse of labor a few generations ago. Sustained abuse of technologists could lead to the destruction of business and the free-enterprise system. The path is clearly marked for increasing government control of education, scientific research, and ultimately of business itself. Any business that does not make effective use of its technologists and by its attitude discourages the pursuit of technology is accelerating the progress of the nation down this road to government ownership.

"All is not well when the campus employment representatives of the marketing department of a large corporation can give assurance that in his company there are 20 engineers in sales work who are better paid than the best paid research and development worker."

He said that the study he reported on was undertaken "in the hope of developing information which will be helpful to business in improving its success and and at the same time lead to greater participation of technologists in the responsibilities and benefits of business."

At the conclusion of his report, he

recommended that technologists should give more attention to a thorough understanding of business principles; non-technical managements whose success record is not good should give increased attention to the technological point of view and try to understand and assimilate it rather than exclude it. In selecting employers, he suggested, technologists should give careful consideration to the type of published information, such as that included in Mr. Watson's study.

ARF To Boost Reactor Level

Approval has been received by Armour Research Foundation of Illinois Institute of Technology to boost the power level of its nuclear reactor to 100,000 watts, making it the largest of its type in the world.

The reactor was the first one in the nation established for private industrial research. Previously, the maximum power allowed was 10,000 watts.

A similar reactor operated by the Japanese has reached a power level of 62,000 watts.

Approval of the power increase came as a result of a careful study of the operating characteristics of the reactor, Leonard Reiffel, director of physics research at ARF, reported.

Placed in operation in June, 1956, the "water boiler" reactor uses uranium 235

in a water solution as fuel. This fuel is contained in a spherical core of steel one-foot in diameter, where the fission, or atom splitting, takes place. Because of the high power being generated in a small core, the reactor efficiency is comparable to other designs operating at considerably higher power.

The reactor produces neutrons and gamma radiation for research in nuclear physics, biology, chemistry, space technology, solid-state physics and medicine. Typical projects now underway include production of new plastics, analysis of human tissue, development of new petroleum processes, determination of the structure of crystals, production of short-lived radioactivity for medical purposes and the design of new radiation detection methods.

Twenty-four industrial firms participate in the Foundation's nuclear reactor research program.

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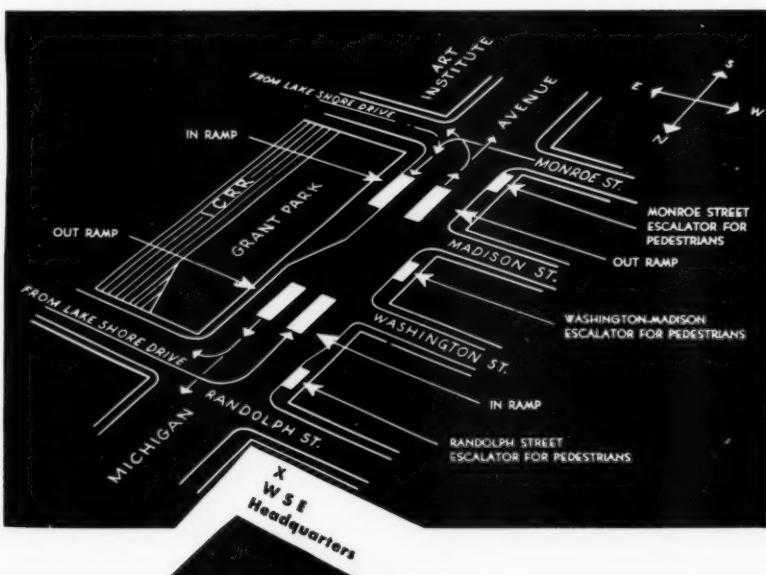
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Below: map showing Park Department Underground Garage



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